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8 OCT 1971

MEMORANDUM FOR: Executive Director, NPIC

SUBJECT : The [redacted] 1540 Light Table with Associated Optics 25X1

1. Summary - The development effort that resulted in the [redacted] 1540/B&L 240 viewing system began more than five years ago. IEG participated fully in the development of the table, and played a decisive role in the choice between competing microstereoscopes. The 1540/240 viewing system has some good features, and it has some bad features, a number of which are correctable, others of which may not be. On balance, it is a good system, well-suited to the present IEG task, and better than the viewing systems that preceded it. IEG can affirm that the 1540/240 system is good workable equipment. We cannot affirm that it was a good investment, as this involves a summary judgement of the R&D/contractual process that we are not prepared to make. 25X1

2. Delivery - The following table summarizes the numbers and distribution of 1540/240's and ancillary equipment on hand:

Item	Number	Per PI
1540 Light Tables	265	1
Zoom 240 Microstereoscopes	265	1
Mod 28 Stereo Rhomboid Arms	265 pair	1 pair
1.0X Stereo Objective Lenses	265 pair	1 pair
2.0X Stereo Objective Lenses	180 pair	1 pair per 1 1/2 PI's

As will be explained in more detail later, our experience with [redacted] imagery requires a greater capability for magnification than is provided by the equipment mix listed above. Therefore, the following equipment has been ordered and is expected to be delivered before [redacted] 25X1 25X1

GROUP 1
Excluded from automatic downgrading and declassification

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Item	Number	Per PI
2.0X Stereo Objective Lenses	100 pair	1 per PI when added to the 180 pair on hand.
2.0X Wide Field Monoscopic Objective Lenses	223	1 per PI

3. Maintenance - An evaluation of the records of the Equipment Performance Branch for the period February through August, 1971, shows the maintenance required for the 1540 table to be high, but perhaps not inordinately so for a machine of this complexity. An analysis of the record shows no major design fault, and the number of trouble calls is gradually decreasing. Many of the trouble calls are vexing, in that they are caused by a poor selection of component parts by the contractor. A frequent example of this is the motor reverse switch, which costs less than $0.20, and which would last the life of the equipment were it of slightly better quality. While the number of trouble calls is decreasing, the time that tables are out of service remains over-long. At the present time there are nineteen 1540 tables in a repair status, and several have been there for more than 30 days. This is caused by an inadequate on board supply of spare parts, and by an occasional shortage of qualified repair personnel in the Equipment Performance Branch.

4. PI Likes - A recent survey taken among the PI's shows almost universal approval of two features of the 1540/240 system:

a. The light source is felt to be more than adequate, and all appreciate the relative coolness with which it operates.

b. Most commented favorably on the film drive system with its variable speed controls and its capacity to handle different film formats quickly and easily.

5. PI Dislikes - Generally, the PI's like the [redacted] Zoom 240 Microstereoscope. However, most of the negative comments

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about the 1540/240 system center about the detachable lenses for this scope, the mating of the scope to the table, and the controls that move it in and out of focus.

a. Stereo and monoscopic objective lenses - First, [redacted] film has more information than we can conveniently extract with the numbers of higher magnification detachable lenses we have on hand. An off-the-shelf remedy is to double the number of 2X stereo objective lenses, so that every PI has a pair, and to double the magnification of, and increase the field of view of the monoscopic objective lens used for search. We have ordered these lenses. A longer range remedy is to increase the magnification of the Zoom 240 system by design changes. Toward that end, we have asked TSG/RED and TSG/ESD to study the feasibility of boosting the Zoom 240 magnification from 60X to 90X or even 135X. This would require the development of 3X monoscopic and stereo objective lenses, and 15X eyepieces. The feasibility of these design changes should be known soon.

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b. Eyepieces - The second lens problem is with the 10X wide field tilt-top eyepieces purchased with the Zoom 240's. These lenses have an eye relief of 16MM as compared with the 22MM eye relief of the recently discarded B&L Zoom 70 10X eyepieces. Because of this small eye relief, PI's must hold their eyes so close to the optics that they frequently bump the optics out of alignment with their noses. The problem is compounded for the PI who wears glasses. There are a number of Zoom 70 eyepieces still in IEG. They were "liberated" before the Zoom 70's were released to the EXRAND equipment bank. Strenuous efforts are now being made to recover the rest of the Zoom 70 10X eyepieces. On balance, while the tilt-top eyepieces cause PI irritation and complaint, it is not so serious a problem as to require the wholesale replacement of the eyepieces.

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c. Scope Mounting - The PIs report that the scope does not fit properly into the ring mount on the bridge of the table. This is caused by a slight straying from precise tolerances on the part of both manufacturers. The result is a small amount of play in a joint that should be rigid. There appears to be no ready "fix" for this problem. Considered by itself, it is an irritation rather than a serious problem. Considered in a wider sense, it is another contributory factor to the "tenderness" of this optical system toward being jarred out of alignment.

d. Focus Problems - The focus of an optical instrument is a function of magnification. As the magnification increases the field of focus becomes smaller, and thus the control of focus becomes more critical. The Zoom 70's were used at magnifications of 30X or less, the Zoom 240's are used routinely at 60X, and higher magnifications are contemplated. External shocks and vibrations that were imperceptable at 30X become distractions at 60X. The PI's report that the Zoom 240 focus controls do not have sufficient drag to hold critical focus, thus continual refocussing is a necessity with this equipment. Also, during routine checks, TSG/ESD has discovered that the Mod 28 stereo rhomboid arms can become misaligned so that they no longer travel in a plane parallel to the surface of the table. This condition can cause a focus problem in the stereo mode. The degree and extent of this latter focus problem among the 265 IEG Zoom 240's is unknown, and would require a careful survey to determine.

e. Vibration - The effect of ambient vibration at high magnification is to degrade resolution and increase eye fatigue. Most PI's report noticing the effects of vibration while using the 1540/240's. The degree to which this is a problem depends on where and on what floor the equipment is located. [redacted] 25X1 has been studying 25X1 the problem for several months, and has developed a

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"fix". Within six weeks, [redacted] will deliver a redesigned 1540 bridge assembly in kit form for operational testing. If the new bridge reduces vibration significantly, then it is expected that it will be retrofitted into all the 1540's. This may be a costly exercise. 25X1

6. The 1540/240 as a System - Many PI's have commented that using the 1540/240 viewing system is a slow and tedious way to search [redacted] However, it is also true that the search task, properly carried out, is a painstaking and meticulous process. Two current projects will have a bearing on the problem of searching the [redacted] These are the extensive testing that is planned for the four prototype Search and Scan PI Stations that are due to arrive in December, and the [redacted] investigation, currently underway, into the value of stereo scanning. Should either or both of these projects have positive results, the inevitable conclusion will be we have too many 1540/240's. This is not a conclusion that is possible now, nor was it possible two years ago. The 1540/240 viewing system should remain our principal exploitation tool for the next three to five years. 25X1 25X1 25X1

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Chief, Imagery Exploitation Group
NPIC

Distribution:
Cy 1 - NPIC/O/DIR
2,3 - NPIC/IEG
4 - NPIC/PPBS
5 - NPIC/TSG
6 - NPIC/IEG/WGD
7 - NPIC/IEG/EGD
8 - NPIC/IEG/MSD
9 - NPIC/IEG/SD
10 - NPIC/IEG/PHD
11 - NPIC/IEG/OD
12,13 - NPIC/IEG/OD/TPB

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